Fishpen Culture as a New Production System in Dammed Valleys in the Mid-Casamance, Sénégal

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Background

The mid-Casamance, Sénégal, is a rain-fed area. Because of droughts, environmental degradation and decreasing land availability, the situation of its rural farmers has worsened over the last two decades and appears set to decline even further. Droughts have very serious negative impacts: soil and mangrove degradation, decreases in plant and animal diversity, and loss of cultivable land with a decrease of production.

To solve these problems, the 'Project de Gestion de l'Eau dans la Zone Sud'(PROGES) is establishing various types of dams, for example, an anti-salt dike inland from the Versan basin; water retention dikes further inside valleys, and other small retention dikes, also inside valleys. The dikes were constructed mainly to increase agricultural production (e.g., rice by up to 50%) but can be used to produce fish to raise protein supply and incomes through integrated systems. Dikes may also change habitats, fish biodiversity and aquatic productivity.

There have been a number of fisheries and aquaculture studies in the area, e.g., Albaret 1987; Diadhiou et al. 1992; Diallo 1992, 1993). Fishpen culture is a possible means to increase fish production in this area and to develop aquaculture without negative environmental effects. Two dammed valleys, Guindir and Badobar, in the mid-Casamance were chosen as sites to study this possibility (Fig. 1).

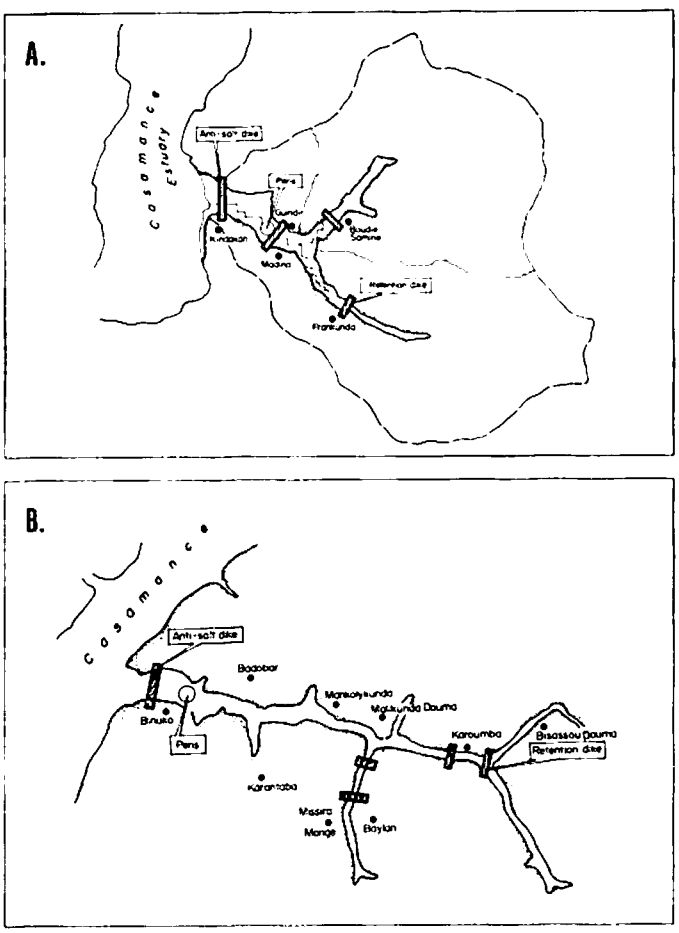


Fig. 1. A. The Guindir valley. B. The Badobar valley. Two dammed valleys in the mid-Casamance, Sénégal and the locations of their dikes.

The Fishpen Study

Four pens, each with a 625 m² surface and 1 m deep, were built with fine mesh nylon (14 mm) in each valley. Wild *Sarotherodon melanotheron* (Sm) from 7.7 to 25.4 g and *Tilapia guineensis* (Tg) from 7.7 to 35.0 g were stocked at densities ranging from 1.5 to 2.5 individuals/m² in pens (Table 1). The ratios used depended upon the fish available from the wild catches. The production systems used were considered semi-intensive.

In each valley, one pen received feed (G1 and B1); one was equipped with mangrove branches (20 heaps of 5 kg each) but as an acadja system and received no feeding (G2 & B2); one had mangrove branches (20 heaps of 5 kg each) and feeding (G3 & B3); and one had no inputs at all (G4 & B4).

The feed used was 70% rice bran and 30% palm oil cake. After oil extraction from palm oil nuts by grinding, the residue (cake) is used as fish, chicken or pig feed with a little mud as a binder to minimize losses. This feed was given to fish in pens G1, G3, B1 and B3, at 5% of their biomass. The pens were sampled monthly (8-10% of the stock) and fish weighed individually. The rearing periods were 140 days at Guindir and 150 days at Badobar.

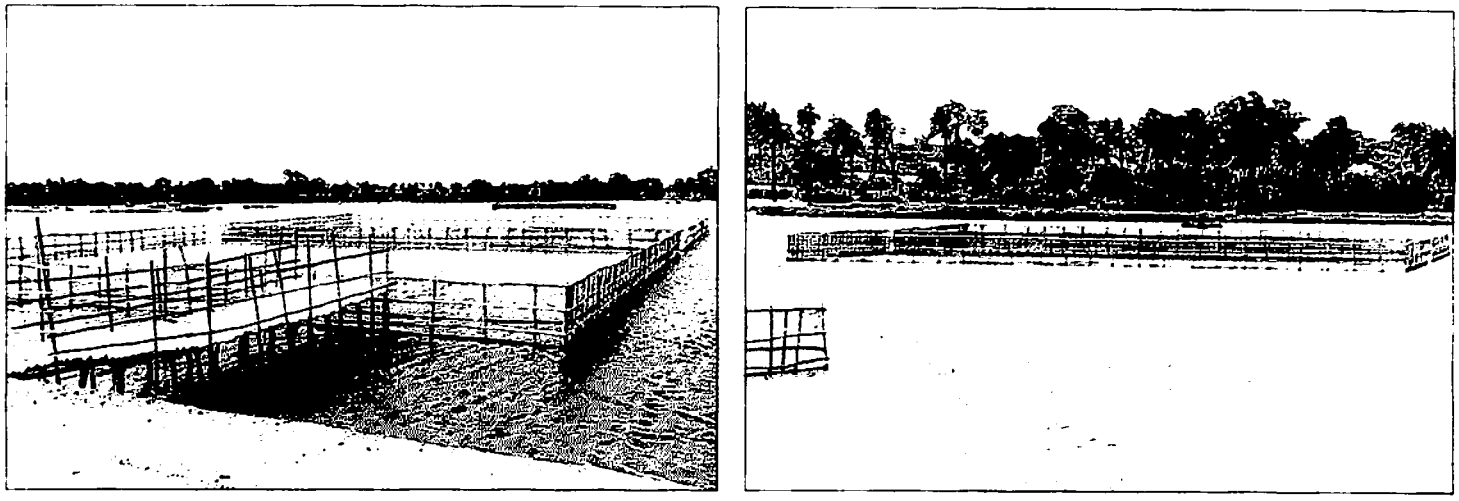
Results and Discussion

Tg had better growth than Sm at both sites. Net production ranged from 48 to 185% of the stocked biomass at Guindir and from 154 to 360% at Badobar. Recruits represented 6 to 40% of net production. Recruits comprised juveniles from breeding of the stocked Sm and Tg, plus wild fishes that entered the pens during construction or through the mesh. The presence of four additional species was noted at harvest at Badobar: *Clarias gariepinus*, *Hemichromis fasciatus*, *Tarpon atlanticus* and *Ethmalosa fimbriata*.

Table 1. Experimental pen culture of tilapias (Sm = *Sarotherodon melanotheron*; Tg = *Tilapia guineensis*) in the Guindir (G) and Badobar (B) valleys of the mid-Casamance, Sénégal. The culture periods were: 140 days (G) and 150 days (B).

Treatment		Stocking						Harvest					
Pens	System	Species	Ratio	Numbers	Total density (no./m²)	Mean individual weight[b] (g)	Total weight (kg)	Total weight (kg)	Net production (kg)	Mean individual weight[b] (g)	Mean individual weight gain (g)	Recruitment	SGR[c] (%/day)
G1	Feed	Sm:Tg	2.0:1	834:416	2.0	22.3(1.9):21.6(2.9)	27.6	78.5	50.9	55.4(5.5):60.5(5.8)	33.1:38.9	9.9	0.66:0.74
G2	Branches	Sm:Tg	1.5:1	759:491	2.0	9.7(0.9): 9.4(0.9)	12.0	26.6	14.6	18.7(2.6):20.0(2.6)	9.0:10.6	2.0	0.47:0.54
G3	Feed + branches	Tg[a]	-	1,250	2.0	35.0	63.8	65.2	21.4	57.8(6.2)	22.0	1.5	0.36
G4	No inputs	Sm:Tg	0.5:1	358:705	1.7	12.7(2.4):12.7(2.5)	13.6	32.1	18.5	29.7(4.6):22.7(4.6)	17.0:10.0	1.2	0.61:0.41
B1	Feed	Sm:Tg	4.6:1	1,241:269	2.4	20.1(2.5):15.6(2.3)	29.1	88.8	59.6	53.9(4.7):86.3(3.6)	33.8:70.7	17.8	0.63:1.22
B2	*Branches*	Sm:Tg	6.0:1	1,109:189	2.1	7.7(1.5):7.7(1.5)	12.2	81.7	69.5	42.6(4.6):37.5(3.5)	34.9:29.8	20.0	1.16:1.00
B3	Feed+ branches	Sm:Tg	1.6:2	180:1,129	2.1	22.1(2.0):25.4(2.1)	32.7	117.5	84.9	56.4(2.9):82.1(2.8)	34.3:56.7	32.9	0.61:0.81
B4	No inputs	Sm:Tg	3.5:1	1,079:308	2.2	16.0(2.0):12.7(2.2)	21.2	33.1	11.9	59.8(1.4):44.0(2.0)	43.8:31.3	33.1	0.92:0.81

[a] Sm not available from wild catches.
[b] Figures in parentheses are standard deviations.
[c] Specific growth rates.



The experimental pens: Left, Guindir; right, Badobar. (Photos by A. Diallo).

These undoubtedly reduced the growth of stocked fish by competing for feed. For the pens that received feed (G1, 180 kg; G3, 248 kg; B1, 123 kg; B3, 232 kg), the feed conversion ratios were: G1, 3.5; G3, 11.2; B1, 2.1; B3, 2.7.

The net production obtained from pens with feeding and with branches and feeding were promising, whereas those from pens without inputs were poor. Fishpens, especially those with branches and feeding, provide local refuges to act as nurseries. To improve this system, it must be considered as part of a water management system and be well integrated. Problems to be solved include: poor knowledge of the farmers about fish culture; bird predation; theft; and variable management of available water, which is also used for different purposes (mainly agriculture).

A socioeconomic survey is ongoing in the area. The local price of fish at the market is low, about 100 FCA/kg (~ US$0.25). These trials were preliminary and form part of a larger program of research and development. The vast majority of what the development community proposes and attempts in this area is experimental. Integrated systems that include fishpens and fishponds should be more thoroughly investigated and, if they succeed, more widely transferred to improve the conditions of rural farmers in the Casamance.

Further Reading

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